



# **AEMO DER Register**

**Collecting information -  
Small generators and their technical characteristics**

**Clean Energy Council  
Online Installer Night – New South Wales, 27 May 2020**

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# Ausgrid customers



## Customers

- Around **1.8 million** customers ranging from rural to CBD, heavy industrial to residential, ~1.6 million residential and ~200,000 non-residential
- Around **150,000** customers have a small generator (Solar PV, Batteries or other types)
- Around **4 million** people live or work in our network

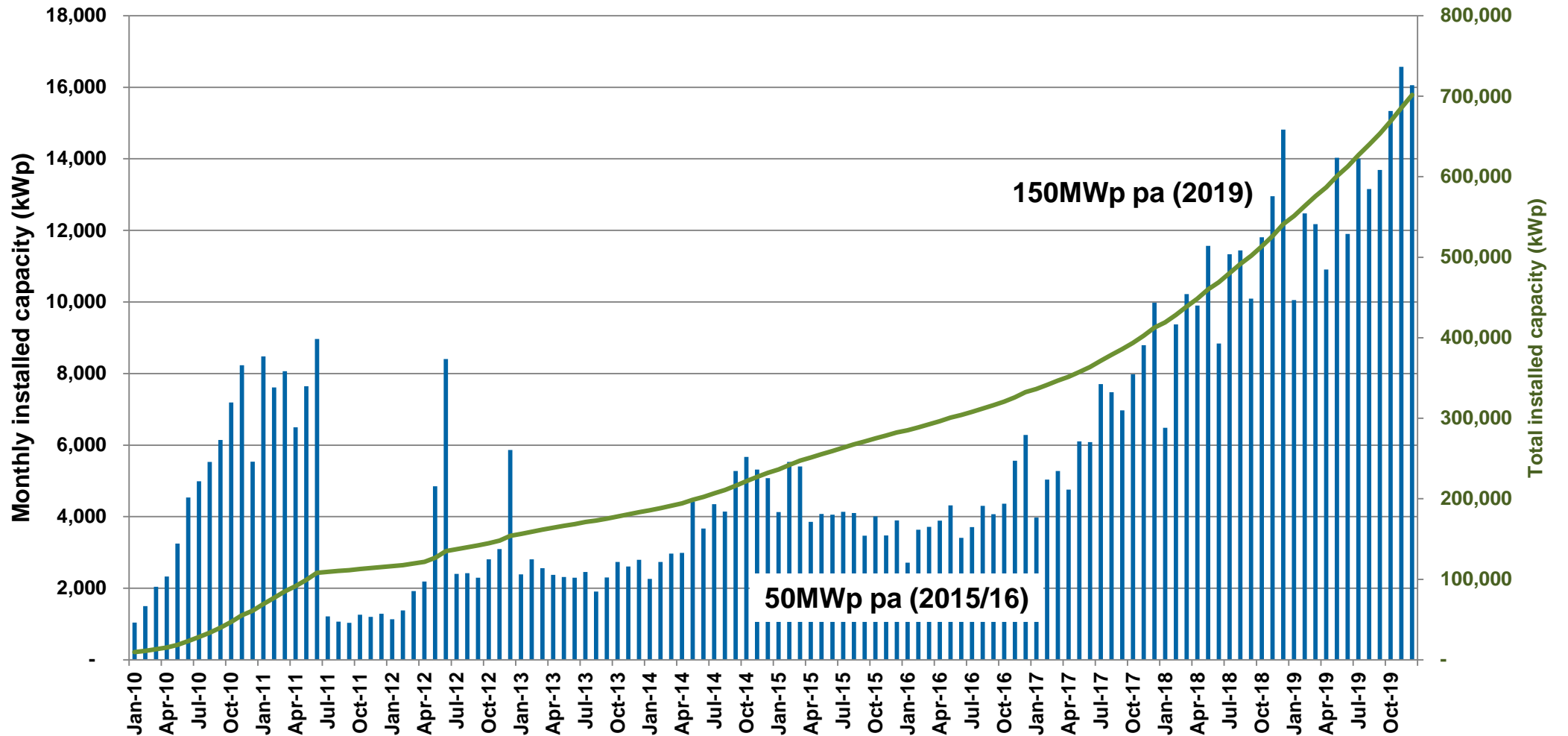
## Electricity Demand

- Maximum Ausgrid Summer Demand, **~5700 MW**
- Maximum Ausgrid Winter Demand, **~4800 MW**
- Minimum Ausgrid Demand, **~1800 MW**

## Annual Customer Consumption

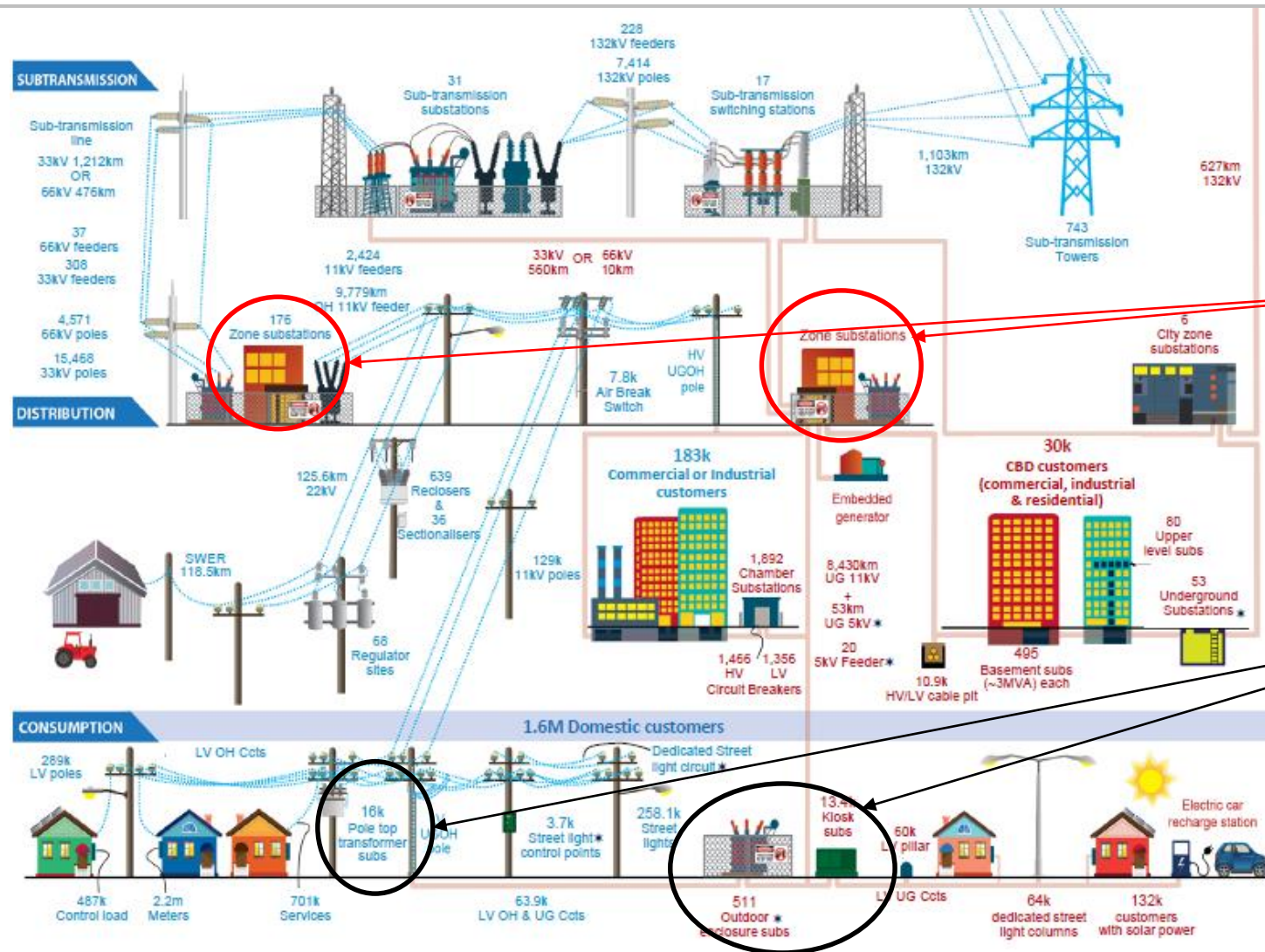
- Residential; **~ 8,500 GWh (34%)**
- Non-residential (Low voltage); **~ 11,500 GWh (45%)**
- Non-residential (High voltage); **~ 5,300 GWh (21%)**

# Small-scale solar trends - Ausgrid





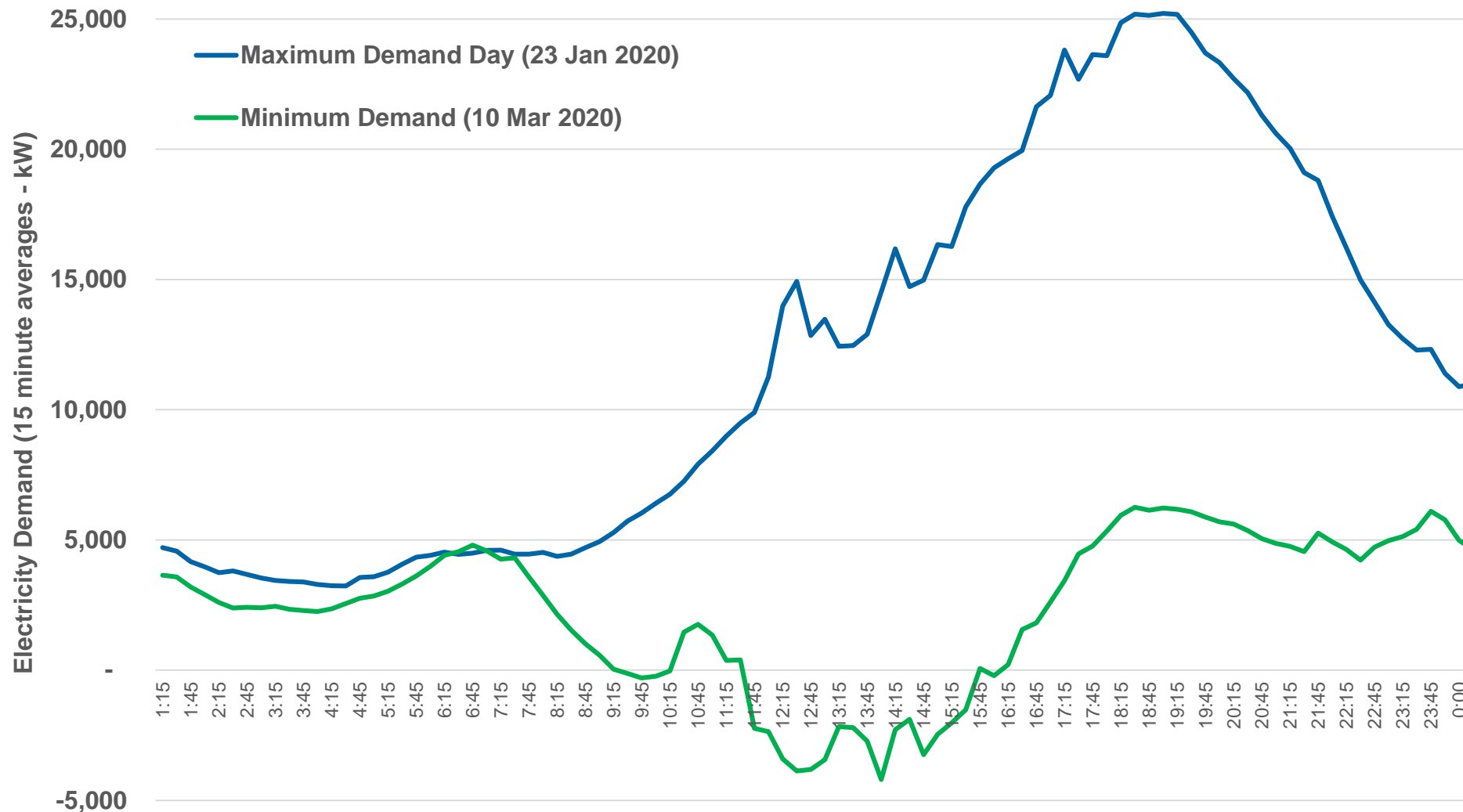
# The Ausgrid network



**180 zone substations  
converting 132kV, 66kV or  
33kV to 11kV**

**30,000 distribution centres  
(pole or ground mounted  
transformers) converting  
11kV to Low Voltage**

# PV impacts on the network – zone substation



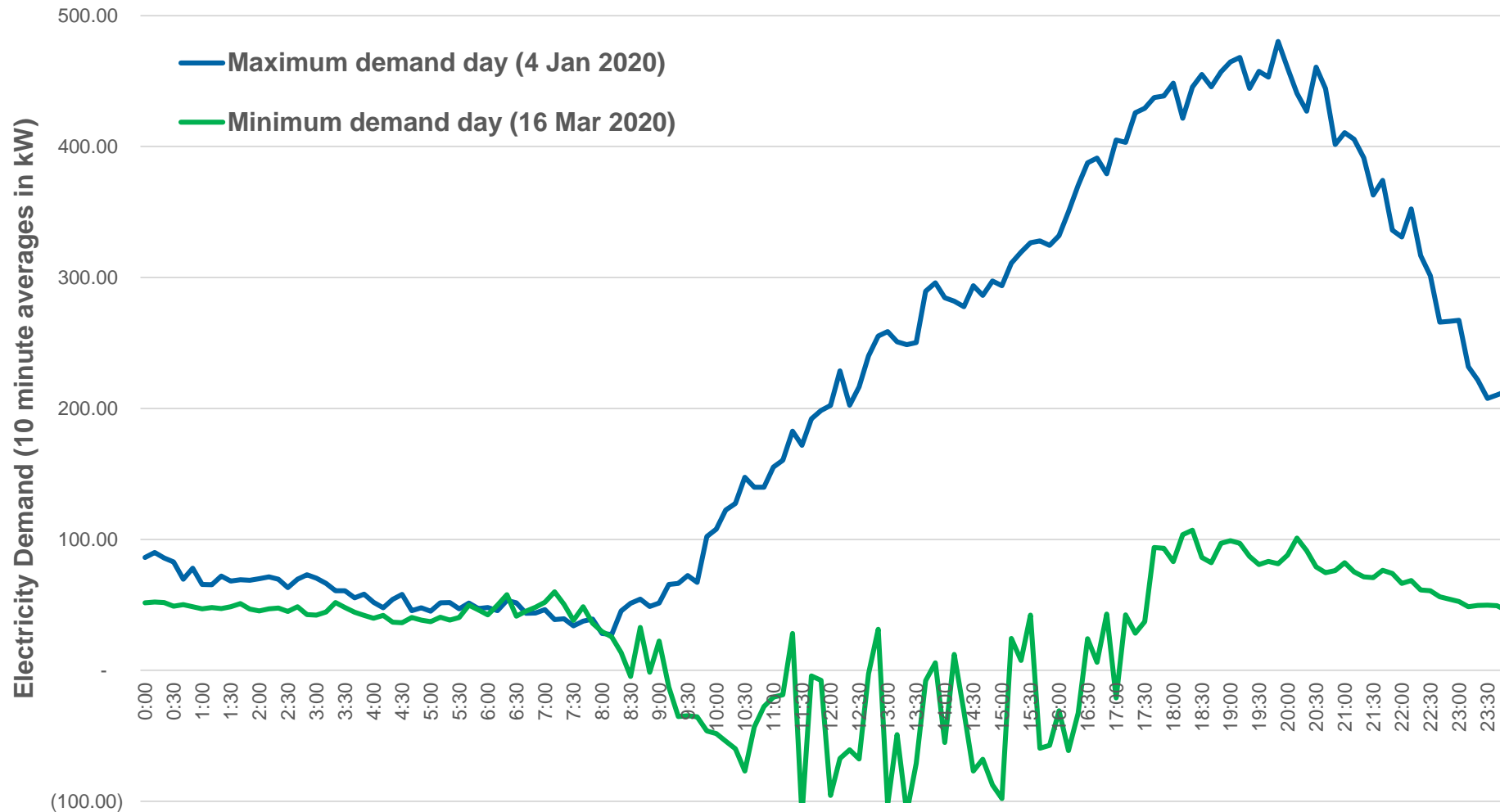
## Zone Substation;

- Hunter region (Newcastle)
- Residential customers; 7500
- Non-residential customers; 400
- ~13MW PV solar panel capacity
- ~2 MW gas generator

## 1 Nov 2019 to 31 Mar 2020

- Max demand of 25.1 MW
- Min demand of -4.2 MW
- 53% of days over the period had reverse power flow
- On some days, 20% to 30% of the time during the day, the electricity flows are reversed

# PV impacts on the network – distribution centre



## Distribution Centre;

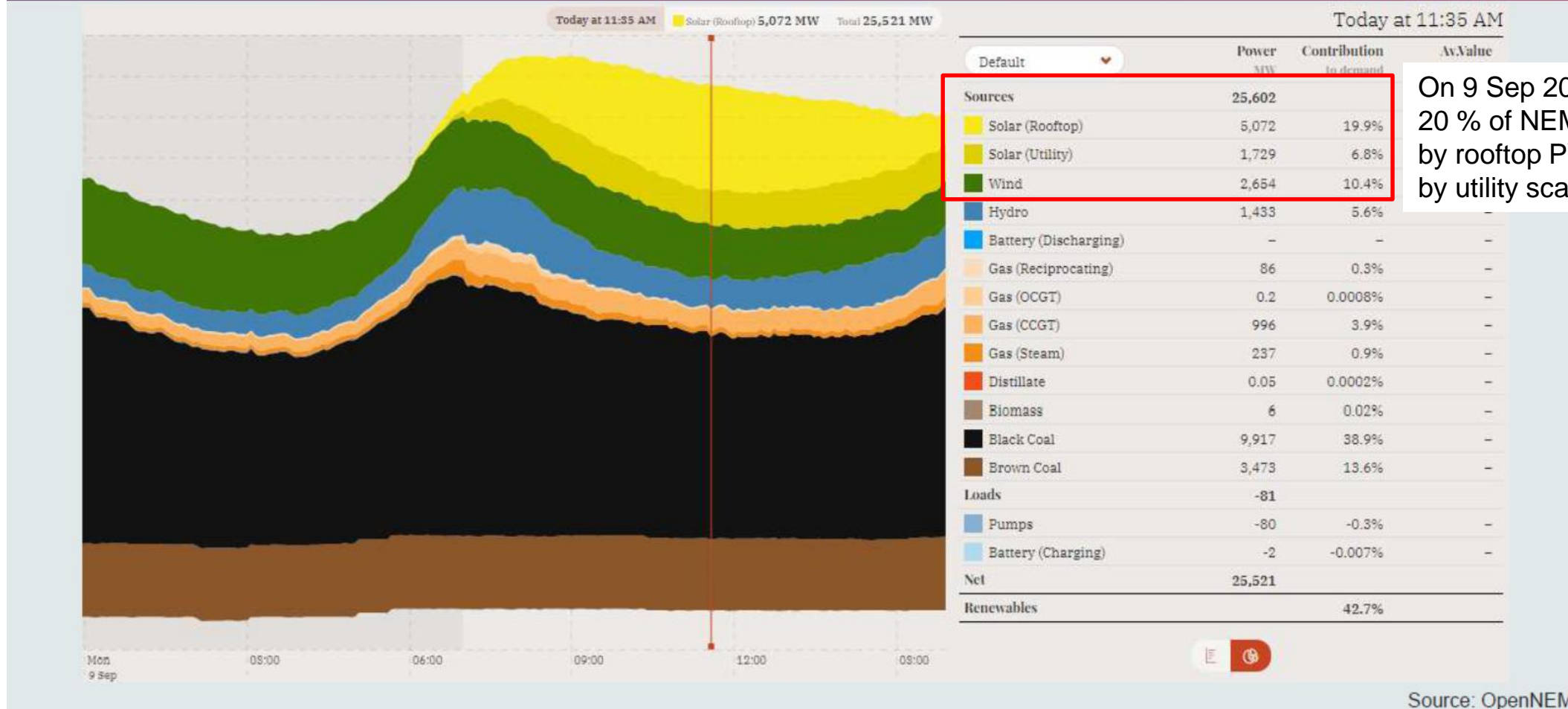
- Hunter region (Maitland)
- 104 residential customers, 39 with solar
- ~212 kW of PV panel capacity

## 1 Nov 2019 to 31 Mar 2020

- Max demand of 480kW
- Min demand of -110kW
- 83% of days reverse power flow was experienced
- Average of 3 hours per day with reverse power flow.

# Rooftop PV impacts on the grid operator

## High rooftop PV in the operational domain

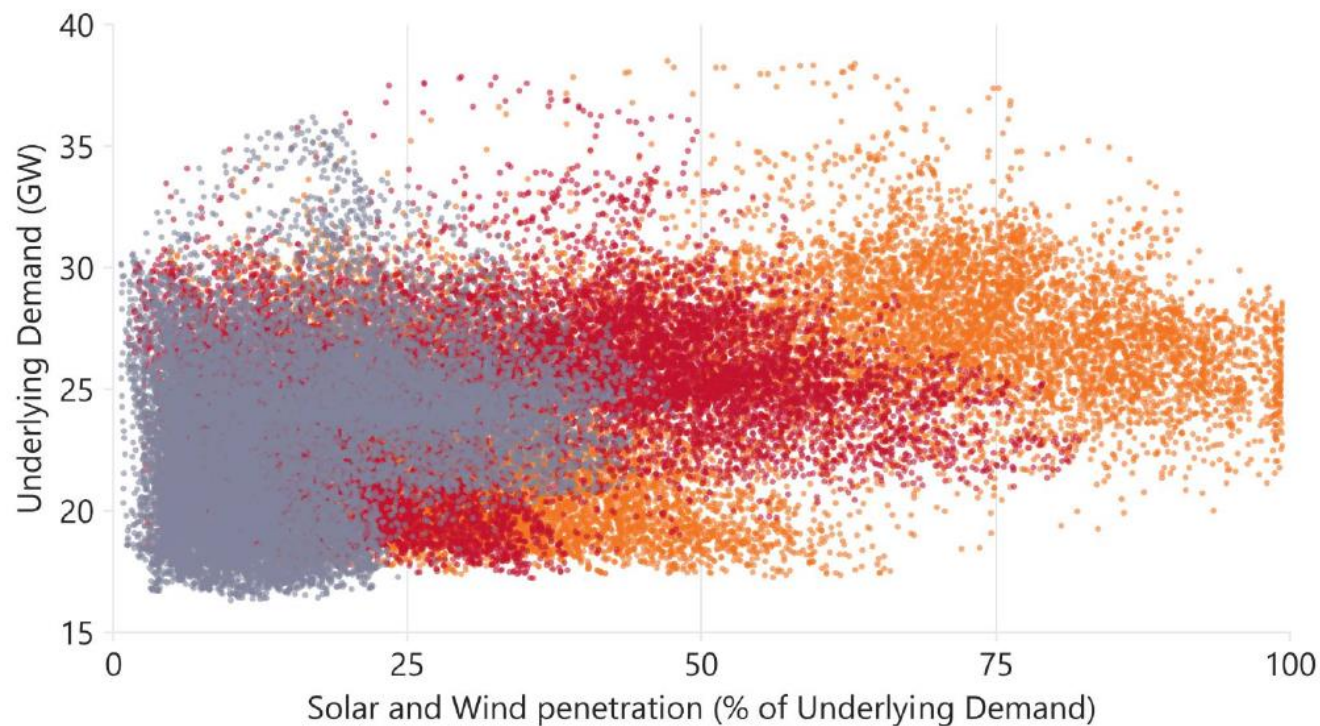


On 9 Sep 2019 at 11.30am;  
20 % of NEM demand was met  
by rooftop PV and 17% was met  
by utility scale wind and PV



# AEMO Renewable Integration Study

## Increasing wind and solar



- In 2019 the **instantaneous penetration of wind and solar generation in the NEM** was just under 50%
- By 2025, this could reach:
  - **75%** under the ISP **Central** scenario
  - **100%** under the ISP **Step Change** scenario



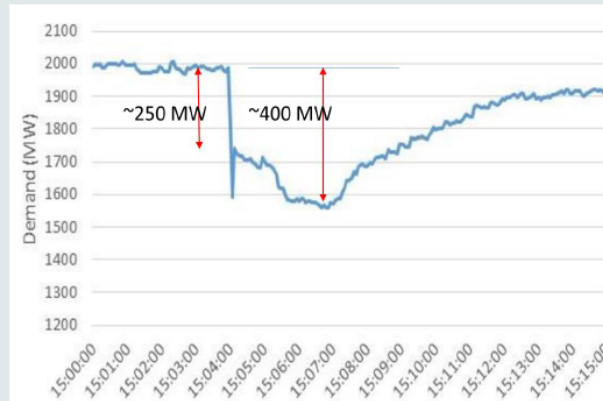
# Grid disturbance inverter response

## Loss of 40% of distributed PV

- 3 March 2017: Series of faults resulted in the loss of ~610 MW of generation in SA
- Flows on Heywood interconnector increased to ~918 MW.
- Estimated that demand reduced ~400 MW
- Estimated that distributed PV reduced by ~150 MW (40%)
- Projecting forwards, loss of 40% of DER will exceed credible contingency sizes, possibly requiring additional frequency control reserves.



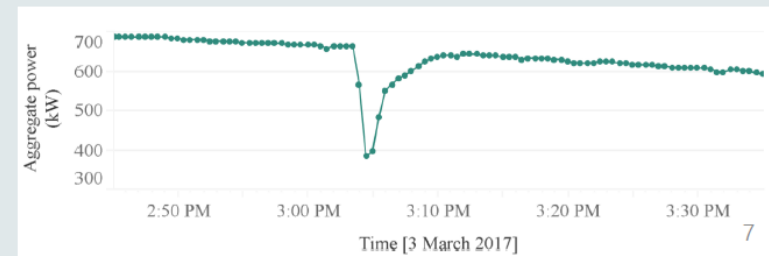
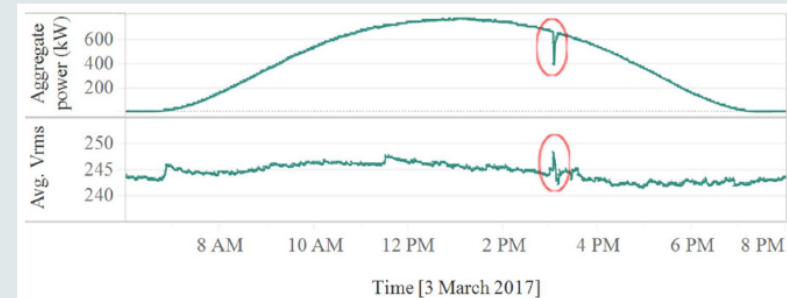
3 March 2017: Demand in South Australia:



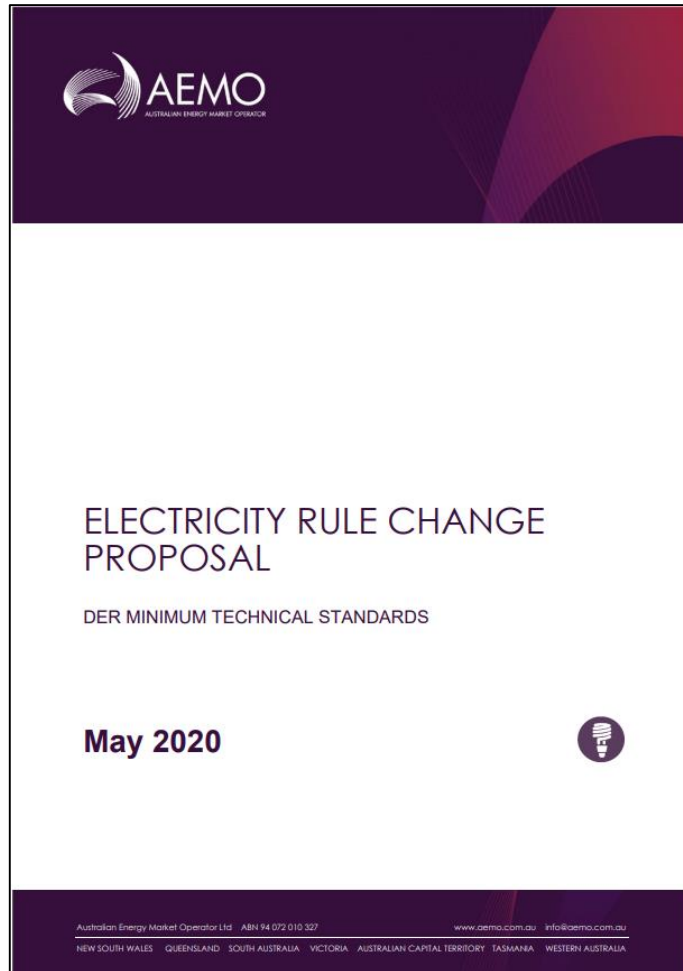
Data from Solar Analytics (~200 distributed PV systems) confirms disconnection of some inverters:

Analysis by Naomi Stringer, UNSW Sydney  
Data from Solar Analytics

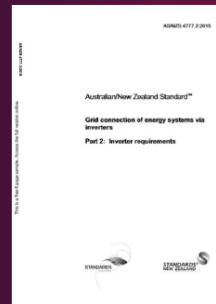
Generation by distributed PV:



# Inverter standards and DER minimal technical standards



## Addressing challenges through performance standards



AS/NZS4777.2 is the Australian Standard for Grid Connection of energy system via inverters: Inverter Requirements

- AEMO submitted a proposal to review the Standard in June 2019,
- CEC provided feedback that was incorporated into the submission,
- Currently the exact changes/values are being consulted on with inverter manufacturers, distribution network service providers, and installers (through the CEC).

Source; <https://assets.cleanenergycouncil.org.au/documents/events/Solar-Masterclass-Series-2019/03-Taru-Veijalainen.pdf>

# The benefits of collecting DER information

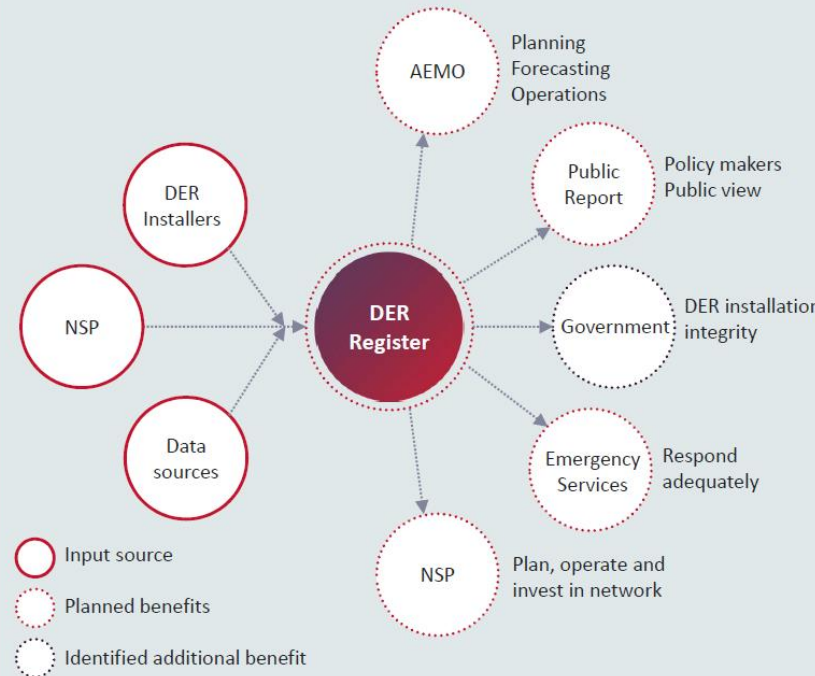
Collecting better information about DER will help to understand the performance, impacts and to forecast the effects of Distributed Energy Resources (DER) on the electricity system. This will lead to benefits including;

## Customers and the community

- Lower costs for all customers due to more efficient investments, operations and decisions
- Improved safety, security and reliability of electricity supply
- Improved DER hosting capacity and more renewable energy generation in the community

## DER Register

- *Required to be implemented by the National Electricity Rules*
- *A national database of DER assets to enable the realisation of consumer value and enhance power system reliability via DER installed in homes and businesses across Australia*
- *Implemented from 1 December 2019*



## Grid and market operation

- More efficient management and operation of the electricity market and grid
- Better system security outcomes and response to grid disturbances
- Better decisions around the development of two-way markets

## Electricity networks

- Better asset investment decisions
- Better outcomes in operating and maintaining the electricity network (voltage management, safety, reliability)
- Better understanding of grid disturbances and our role in managing system security



# The AEMO DER Register Process in NSW

and the

# Ausgrid Connection Application Process for Small Generators



# What is the AEMO DER Register?

The [Australian Energy Market Operator \(AEMO\) Distributed Energy Resources \(DER\) Register](https://www.ausgrid.com.au/Connections/solar-battery-and-embedded-generation/Distributed-Energy-Resources-Register) is a database of information that contains technical information about all customers' small generating or battery systems installed on the electricity distribution network. A DER includes the following types of embedded generators:

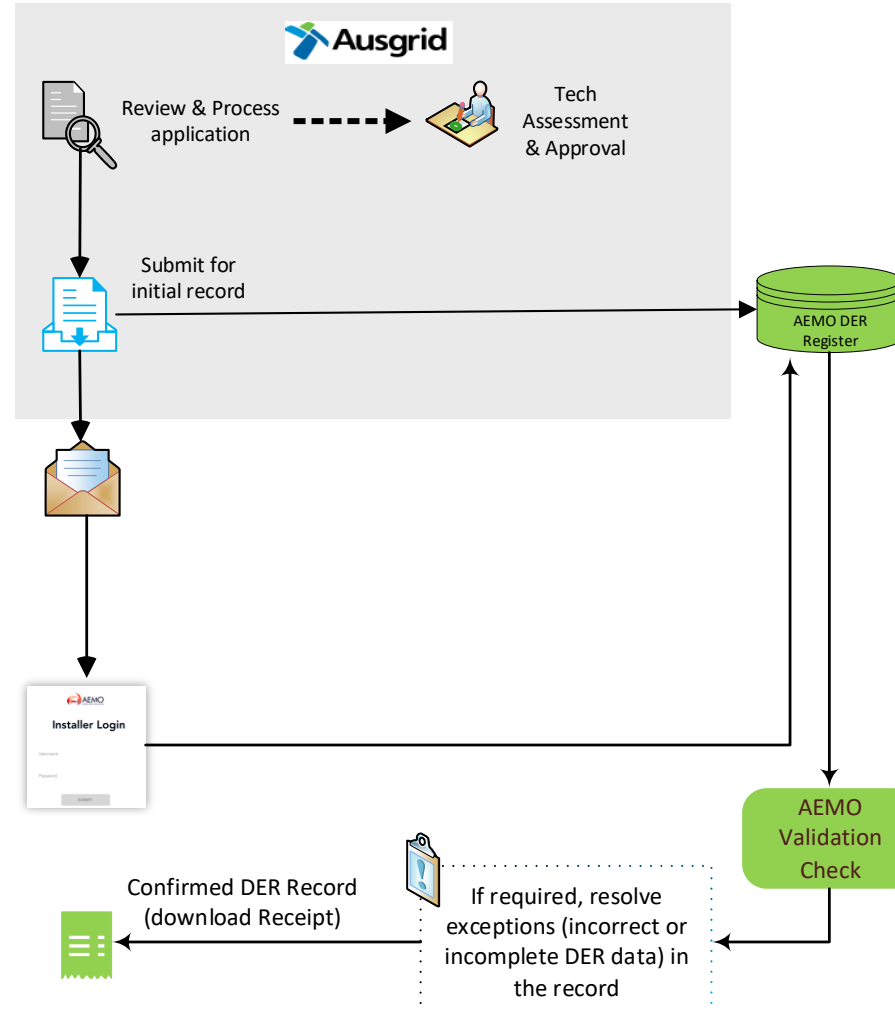


# Collaborative approach to collecting data in NSW / ACT



**Connection Applicant**

- 1 Initiates connection request in Better Connected
- 2 Application processing and approval
- 3 Receive Ausgrid Email Notification with NMI, DER Job number
- 4 Login to AEMO portal to validate and submit as installed details
- 5 Resolve Exceptions and Confirmed Record



# What is not changing?

Complete the Ausgrid online application forms for embedded generators in the same way as before and no change to the forms, fees and approval process. You will receive an approval notification in the same way as before.

- Select: <https://www.ausgrid.com.au/Connections/Get-connected/Apply-for-a-connection>

## Choose your application type

- ⊕ Check your address is in our network area
- ⊕ Apply for a new connection
- ⊕ Apply to modify an existing connection
- ⊕ Apply to connect solar panels, batteries or an embedded network
- ⊕ Apply to Connect, Modify or Disconnect a Permanently Unmetered Supply (PUMS)
- ⊕ Apply for a permanent disconnection (excluding PUMS)
- ⊕ Make a preliminary enquiry

### ⊖ Apply to connect solar panels, batteries or an embedded network

**Notice to all customers installing generator systems. For applications approved by Ausgrid from 18 May 2020, you will be required to update information about installed generation equipment in the Australian Energy Market Operator's (AEMO) Distributed Energy Resources (DER) Register.**

Once your connection application for embedded generation (EG) has been approved by Ausgrid:

- As a condition of your customer connection contract, and in accordance with the [Australian Energy Market Operator \(AEMO\) DER Register Information Guidelines](#), you will be required to provide details of any small generating unit at your premises.
- This applies to all sizes of generator systems (including batteries and changes to existing systems), from small to large, that are not a registered participant with the AEMO.
- The information needs to be provided within 20 business days of commissioning, altering or decommissioning generation equipment.
- Your installer or licensed electrician will provide information to the AEMO DER Register on your behalf. They will need to hold an account with AEMO for the DER Register and relevant details will be emailed to the connection applicant once an EG connection application is approved.

For further information see [Ausgrid's Distributed Energy Resources page](#).

## Are you modifying a connection?

### For connections under 100Amps

Apply for new embedded generation to an existing premises under 100Amps.

Apply Now

Apply to modify an existing embedded generation system at an existing premises below 100Amps.

Apply Now

### For connections over 100Amps

Apply for new embedded generation to an existing premises over 100Amps.


Apply Now

Apply to modify an existing embedded generation to an existing premises over 100Amps.

Apply Now

# What is changing?

1. There is an amendment to an existing declaration on the online application form about the AEMO DER Register
2. The Connection Applicant will receive a second notification letter entitled "Requirement to complete the AEMO DER Register" and this will include the NMI and a unique DERR Job Number

 **Ausgrid** Connecting communities, empowering lives

**Notification Letter:**

Requirement to complete AEMO DER Register

Premises Address: [REDACTED] BERKELEY VALE 2261 NSW

Date	20.05.2020
Website Reference	0503398
NMI	4102 [REDACTED]
AEMO DER Register - DERR Job No	836862-0503398
Name of Applicant	[REDACTED]
Address of Applicant	[REDACTED] BERKELEY VALE 2261

Dear Connection Applicant,

Ausgrid is pleased to inform you that the initial AEMO DER Record for this premise and recent embedded generation application has been created and is now available to access and update with the final technical details of the installed generation equipment within the AEMO DER Register.

The qualified electrical contractor or solar installer that you choose to perform the installation should be an AEMO DER Register account-holder and will be able to submit this information on your behalf.

The final installed generation equipment details must be provided within 20 days of the commissioning or decommissioning of the equipment. In the table above are the details your installer will need to access and submit information to the AEMO DER Register on your behalf including the NMI and AEMO DER Register Job Number.

The DER register is not an Ausgrid initiative or system, further information about the DER register is available at AEMOs website which can be accessed via these links:

[AEMO DER Register Information](#)  
[AEMO DER Register Installer Portal and User Guides](#)  
[AEMO DER Register NSW Fact Sheet for Installers](#)

If you do experience any technical issue with the AEMO DER Register portal, please contact AEMO directly via [AEMOs Support Hub](#): Email: [SupportHub@aemo.com.au](mailto:SupportHub@aemo.com.au) Phone: 1300 236 600

For any questions relating to the Connection Application process or the creation of an AEMO DER Register record please continue to contact Ausgrid.

Requirement to complete AEMO DER Register

NMI (10 digit format) and DERR Job Number is on the AEMO DER Register notification letter sent by Ausgrid



# Accessing AEMO DER Register portal

<https://aemo.com.au/en/energy-systems/electricity/der-register/der-register-portal>

Google Chrome

## DER Register portal

AEMO's Distributed Energy Resource (DER) Register Installer Portal is now live.

As a DER Installer, you are now able to create an account and provide information in the DER Register Portal.

### NSW and ACT Installers:

- You will be required to provide data directly to AEMO's DER Register via AEMO's Portal or via registered mobile applications, such as the Formbay Solar app.
- Your NSP will create an initial record and provide you with a NMI and Job Number which is required to create an account and access the DER record.

### SA, VIC, TAS and QLD Installers:

- Your NSP will collect the data required to update the DER Register – you do not require access to AEMO's DER Register portal.

Also note – You will need an active Job Number and NMI to set up an account.



### DER Register Installer Portal

Note – Please use Google Chrome to ensure browser compatibility with the DER Register Portal.

[Click here to begin →](#)

Please read the below user guide and watch the 'How to' video if you are having trouble accessing the Portal.

For more information on the DER Register, visit the [DER Register page](#) or contact [DERRegister@aemo.com.au](mailto:DERRegister@aemo.com.au).

To create an account for the first time click here. Must have an active NMI and DERR Job Number

## Account Login

Welcome to the Australian Energy Market Operator's Distributed Energy Register

The DER Register is a national database of Distributed Energy Resources or DER. It contains information about small generation assets like rooftop solar, grid-connected batteries and other small generators.

AEMO's role is always to manage the power grid for all Australians. The massive growth in DER in Australia means that at times the power grid is now more reliant than ever on these energy sources, so we need to understand them. We will use this information to support the effective and efficient operation of the electricity system.

Thank you for your contribution to this database. DER is emerging as a critical to the ongoing integrity of the grid. Providing accurate data here will enable AEMO to consider DER to the full extent possible. You can log into your account below.

Please note that the DER Register must be accessed using Google Chrome web browser.

Email Address \*

Password \*

[Forgot your password?](#)

[Sign in](#)

Don't have an account? [Sign up now](#)

## Access Job

Please input your NMI and Job Number details to access the relevant job . For assistance please contact the NSP. NSP Contact details can be found [here](#)

NMI

Job Number

[ACCESS](#)

NMI (10 digit format) and DERR Job Number is on the AEMO DER Register notification letter sent by Ausgrid

# DER Installation Details

**DER Installation Details** Connections & Devices 1

**DER Installation**  
NMI (National Metering Identifier)

4104 [REDACTED]

Connection Agreement 'Job Number'  
12192152-0107968

Approved Capacity (KVA)  
30

Number of phases with DER connected  
3

Central protection and control  
No

Installer identification  
Installer ID

Number of phases available  
3

Islandable installation  
No

This is the DERR Job Number

Details in the DER Installation screen are pre-populated by Ausgrid as part of the initial record creation process (except for Installer ID). Greyed out if not editable

## Installer ID Format;

NSW Electrical License – CEC accreditation number  
Supply at least one of the above or both if available, e.g.  
123456C-A1234567

## Islandable Installation;

Pre-populated with No in most cases (PV only)  
Pre-populated with Yes, if online application form question indicated the installation would be able to operate in back-up mode (e.g. switch-over arrangement with battery)

## Central protection and control;

Pre-populated with No in most cases ( $\leq 10\text{kVA}$  per phase of DER).  
Pre-populated with Yes if a Central Protection device or export controls are required (generally only for larger generator sites,  $> 30\text{kVA}$ )

# Connections & Devices

Relationship between AC Connection Devices (e.g. inverters) and DER Devices (PV panels and batteries) is shown

New equipment can be added and linkages between DER Devices to their parent AC Connection device can be made

AC Connections and / or DER Device can be removed when status is Initial

Existing equipment in Confirmed status can be decommissioned or edited if the generation system is being modified

DER Installation Details **Connections & Devices** 3

Connections & Devices 3 +AC Connection +DER Device

<b>AC Connection-1</b> ID:200000006013945	<input type="radio"/> Validation status: Confirmed Type: Inverter Connection status: Active	<span>Edit</span>
<b>DER Device</b> ID:200000006050157	<input type="radio"/> Validation status: Confirmed Type: Solar PV Device status: Active	<span>Parent</span> <span>AC Connection 1</span> <span>Edit</span>
<b>AC Connection-2</b> ID:200000007676000	<input type="radio"/> Validation status: Initial Type: Inverter Connection status:	<span>Edit</span> <span>Remove</span>
<b>DER Device</b> ID:200000007723890	<input type="radio"/> Validation status: Initial Type: Solar PV Device status:	<span>Parent</span> <span>AC Connection 2</span> <span>Edit</span> <span>Remove</span>
<b>AC Connection-3</b> ID:200000007676001	<input type="radio"/> Validation status: Initial Type: Inverter Connection status:	<span>Edit</span> <span>Remove</span>
<b>DER Device</b> ID:200000007723891	<input type="radio"/> Validation status: Pending Validation Type: Storage Device status:	<span>Remove</span> <span>Parent</span> <span>AC Connection 3</span> <span>Edit</span>

**Example Use Case;** Adding a new PV and battery system to an existing PV system

**Confirmed Status;** Existing PV System (not needed to be updated by installer unless it is being decommissioned)

**Initial status;** New PV system to be installed

**Initial Status;** New battery with its own dedicated inverter (not sharing inverter with a PV system)

# AC Connections

## Edit AC Connection

Equipment type\*  
Inverter

Commissioning date  
25 May 2020  
Clear Commissioning Date

Number of AC Connections  
1

Status  
Active

DRED interaction enabled  
No

Manufacturer  
Enphase Energy

Model Number  
S270-ACB-LN-YY

Series  
S270-ACB-LN-YY

Serial Number  
Serial number

What standard applies to the inverter  
IEC 62109.1; IEC 62109.2; AS/NZS 4777.2:2015

Inverter rated capacity (kVA)  
0.26

### Commissioning Date;

The commissioning date of the AC Connection device(s)

### Number of AC Connections;

for the same type of inverter

### Serial Numbers;

A serial number for each inverter is required

### Inverter rated capacity;

This is for each individual device within the AC Connection group and will be pre-populated if Manufacturer, Model and Series is selected. Manual entry of device capacity is required if device is not found in the list and the Other option is chosen

## Edit AC Connection

Equipment type\*  
Inverter

Commissioning date  
25 May 2020  
Clear Commissioning Date

Number of AC Connections  
1

Status  
Active

DRED interaction enabled  
No

Manufacturer  
Tesla Motors Australia Pty Ltd

Model Number  
AC Powerwall

Series  
Tesla

Serial Number  
Serial number

What standard applies to the inverter  
IEC 62109.1; AS 62040.1.1; IEC 62109.2; AS/NZS 4777.2

Inverter rated capacity (kVA)  
5



# DER Devices

## Edit DER Device

The screenshot shows a form titled "Edit DER Device" with the following fields and values:

- Device type\***: Solar PV (dropdown menu)
- Device sub-type**: Monocrystalline (dropdown menu)
- Number of devices**: 18 (text input)
- Status**: Active (dropdown menu)
- Manufacturer**: Chint Solar Zhejiang Co Ltd (dropdown menu)
- Model Number**: CHSM6610M/HV-315 (dropdown menu)
- Rated capacity (kW or kVA)**: 315 (text input)

Below the "Rated capacity" field, there is a red text note: "Should be 0.315".

At the bottom right of the form are two buttons: "Cancel" and "Done".

Four blue arrows originate from the right side of the slide and point to the following fields: "Device type", "Device sub-type", "Number of devices", and "Rated capacity".

### Pick Lists for Device Type and Device sub-type;

Device sub-types for Solar PV and Storage.

If AC Connection type = Inverter, then DER Device type must be Solar PV, Storage or Wind

### Number of devices;

In this case, number of PV Panels is 18

### Rated Device Capacity (kW or kVA);

Completed by installer, in this case it should be 0.315 kW (each panel has 315 Watts capacity) NOT 315 kW

Total panel capacity should be  $18 \times 0.315$  and will be calculated automatically (e.g. 5.67 kW of panels), not currently viewable in the installer portal

# Protection, Control and Inverter Technical Settings

## 1. Central Protection and Control (DER Installation or premise level)

Central protection and control\*

Yes

Protection and control modes

Export Limitation (kVA)

Export limitation (kVA)

Under-frequency protection

47

Over-frequency protection

52

Over-frequency protection delay

2

Under-frequency protection delay

2

Over-voltage protection

260

Over-voltage protection delay

2

Under-voltage protection

180

Under-voltage protection delay

2

Sustained Over-voltage

255

Sustained Over-voltage delay

15

Rate of change of frequency (RoCoF)

1

Voltage vector shift (VVS)

8

Neutral voltage displacement (NVD)

V

Inter-trip scheme

Describe scheme if in use

Specified by Ausgrid as part of application and approval process

## 2. Inverter response settings (AC Connections level)

Sustained operation over-voltage limit (Vnom-max)

258

Over-frequency limit (Fstop)

52

Under-frequency limit (Fstop-CH)

47

All inverters shall have Volt-Watt response mode (as outlined in AS/NZS 4777.2:2015) enabled with the following settings applied:

Table 1: Volt-Watt response mode settings

Reference	Voltage	Maximum Value P/Prated (%)
V1	207	100%
V2	220	100%
V3	248	100%
V4	258	20%

All inverters shall have Volt-VAR response mode (as outlined in AS/NZS 4777.2:2015) also enabled with the following settings applied:

Table 2: Volt-VAR response mode settings

Reference	Voltage	VAR % of rated VA	Power Factor
V1	207	60% leading	0.8 leading
V2	220	0	Unity
V3	248	0	Unity
V4	258	60% lagging	0.8 lagging

Default values can be auto-populated

# Further Information

## AEMO

### Portal Guides and How To Video

<https://aemo.com.au/energy-systems/electricity/der-register/der-register-portal>

### AEMO Support Hub for the Installer Portal

SupportHub@aemo.com.au

Phone: 1300 236 600

General Feedback: [DERRegister@aemo.com.au](mailto:DERRegister@aemo.com.au)

## Ausgrid

### Connection Operations (for Ausgrid related questions);

(02) 4399 8099

[datanorth@ausgrid.com.au](mailto:datanorth@ausgrid.com.au)

### Ausgrid technical inquiries about embedded generators;

[eg@ausgrid.com.au](mailto:eg@ausgrid.com.au)

## Guides for using the portal

- The user guide includes an overview of the full functionality and how to use the DER Register Portal:

02/03/2020 Guide to DER Register Installer Portal

915.33 KB



- The "How to" video below will assist you with your first time accessing and updating a DER Record.
- Access to FAQs that provide solutions to commonly asked questions - [available here](#).

